



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development Standard Energy Code Proposal Form

084
Proponent Revision 3
Received 6/09/22

Code being amended: ☐ Commercial Provisions ☒ Residential Provisions

Code Section # **R202 – Definitions, R401.1 – Scope**

Brief Description:

Move low-rise multifamily buildings (with dwelling units accessed from interior corridors) from the “residential building” category into the “commercial building” category.

Purpose of code change:

This code change provides a uniform set of code requirements for all multifamily buildings, with the exception of “woody walkup” buildings that have exterior walkway access to the dwelling units. There is no reason for three-story apartments and four-story apartments to be built under entirely different sets of code requirements.

Inclusion of low-rise multifamily under the commercial energy code will result in nearly identical annual energy use, but will allow jurisdictions with advanced local energy codes to bring them to the same standard that is applied to their medium-rise multifamily buildings.

Note that low-rise hotel/motel buildings, a very similar building type, are already built in conformance with the commercial code provisions.

Please refer to the March 2022 comparison study by Ecotope appended to this proposal.

It is the proponent’s intention to propose this change to the IECC.

Your amendment must meet one of the following criteria. Select at least one:

- | | |
|--|---|
| <input type="checkbox"/> Addresses a critical life/safety need. | <input type="checkbox"/> Consistency with state or federal regulations. |
| <input type="checkbox"/> The amendment clarifies the intent or application of the code. | <input type="checkbox"/> Addresses a unique character of the state. |
| <input checked="" type="checkbox"/> Addresses a specific state policy or statute.
(Note that energy conservation is a state policy) | <input type="checkbox"/> Corrects errors and omissions. |

Check the building types that would be impacted by your code change:

- | | | |
|--|---|--|
| <input type="checkbox"/> Single family/duplex/townhome | <input type="checkbox"/> Multi-family 4 + stories | <input type="checkbox"/> Institutional |
| <input checked="" type="checkbox"/> Multi-family 1 – 3 stories | <input type="checkbox"/> Commercial / Retail | <input type="checkbox"/> Industrial |

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Economic Impact Data Sheet

Is there an economic impact: ☐ Yes ☐ No ☒ Maybe

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants, and businesses. If you answered "No" above, explain your reasoning.

There *may* be an economic impact, but the cost could be either higher or lower, depending almost entirely on the selection of additional efficiency packages that is assumed for each code in the comparison. For this reason, the cost in the section below is assumed to be zero.

For commercial code compliance, a high-performance central heat pump water heater provides all the required credits under the 2015 WA commercial code and adds about \$800 per unit compared with a conventional gas water heating system. For compliance with the 2015 Seattle code, which contains many of the requirements currently proposed for the 2018 WA code, that HPWH system, plus credits for DOAS (which is already required by other parts of the code) and lighting provide the required 8 credits, and is likely to add less than \$1000 per unit, which is comparable to the cost of any combination of additional efficiency measures selected to comply with Section R406 in the residential energy code.

There are some prescriptive code differences that may impact cost. When using the commercial buildings provisions:

- Baseline opaque envelope R-values will be slightly less stringent
- Air barrier leakage resistance requirement will be more stringent
- Required ERV efficiency will be slightly more stringent (1.2 cfm/W vs. 1.0 cfm/W)
- Balanced ventilation requirement is already required for low-rise multifamily dwelling units by Section 403.4.4.1 of the Washington State Mechanical Code, so that requirement is not affected by this code change.

Updated Cost Comparison

Options Table, General: The commercial code C406 options for R-2 multifamily cost very little extra, while the residential code R406 options for R-2 multifamily have definite costs attached.

Options table costs for R-2 in the commercial energy code. The following credits are available for the 2021 code. It appears that the reduced pipe sizing credit alone will provide more than the 41 credits required under the new credit system, while *reducing* construction cost, and there are many other options.

- **#20: 42 credits Hot water distribution right-sizing using plumbing code Appendix M** (*reduces* construction cost due to smaller pipe sizes, insulation thickness, and circulation pump size)

(Other available options – those in **bold** below equal 41 credits, total \$0.68/sf)

- #28: 19 credits Residential dishwasher & fridge with Energy Star "Most Efficient" label
- #07: 31 credits High performance DOAS
- **#14: 20 credits Renewable energy** (\$0.37/sf @ \$2.50/W)
- #21: 13 credits Hot water temp maintenance
- #25: 24 credits Reduced air leakage
- **#09: 4 credits 10% lighting power reduction** (\$0.18/sf - PNNL)
- **#11: 6 credits: High-efficacy lamps** (no additional cost)
- **#12: 8 credits main lighting switch for whole unit** (\$0.13/sf - PNNL)
- **#23: 3 credits low-flow shower heads** (no additional cost)
- #29: 6 credits Energy Star "most efficient" label washer & dryer
- **Total of items in bold: 41 credits, \$0.68/sf = \$558 for 820 sf.**

Options table costs for R-2 in the residential energy code. For residential, the TAG has recently approved the NEEA/Ecotope package of R406 changes (21-GP2-073). The required 6.5 credits could be provided for an R-2 multifamily building by any of several sets of options. One group is shown below with heat pump heating. These appear to be the least expensive packages available for multifamily, and the cost for either package will be considerably higher than the cost for meeting the commercial code options.

Residential code credit package, with DHP

- Credit 1.4: 1.0 credit for U-0.20 glazing (\$887)
- Credit 2.2: 1.0 credit for 1.5 ACH HRV (\$2034)
- Credit 3.4: 2.0 credits for Ductless Heat Pump (\$3060)
- Credit 5.4: 2.5 credits for Tier III HPWH (\$318)
- **Total: 6.5 credits, \$6,299**

Other differences between commercial and residential codes; no cost increase

- Most opaque envelope R-values will be slightly *less* stringent, lower cost

Component	Residential	Commercial
Ceiling	60	49
Wood wall	20+5 or 13+10	20+3 or 13+7
Floor	30	38
Below-grade wall	10 or 21+5 TB	10 or 19
Slab on grade	10 for 4 ft	10 for 2 ft

- Fenestration U-values will be *more* stringent, cost difference covered in Credit Package

Component	Residential	Commercial
Windows	0.30	U-0.26
Skylights	U-0.50	U-0.45

- Air barrier leakage resistance requirement will be *more* stringent, cost difference covered in Credit Package

	Residential	Commercial
Test requirement	3 ACH 50	0.25 (0.40) @75 Pa

- Required ERV efficiency will be *slightly* more stringent, cost difference covered in Credit Package

	Residential	Commercial
Efficiency	1.0 cfm/W	1.2 cfm/W

PROS AND CONS

Pros	
Comment	Jonlin response
WSEC-C is easier to interpret/apply for Group R-2 developments; WSEC-R more appropriate for single family, duplex, townhouses.	
It is awkward to have projects that must meet IBC, but are under WSEC-R	
In some developments, there are both 3 and 4 story garden-style apt buildings on the same site, so it is awkward to have them under different energy codes. It would be convenient to allow construction of 3 and 4-story woody walkups under one code	Changed proposal to give builders the option to use commercial energy code for 1, 2, or 3-story garden-style apartments.
Commercial code has been less costly than residential code	

Cons	
Comment	Jonlin response
Moving these structures under the commercial energy code will have a real and negative impact on housing affordability	Commercial code for multifamily appears to be less costly than residential code
This will remove a large segment of the licensed, bonded, and insured builders from pursuing these projects	General contractors' licenses and bonding are not based on which portion of the energy code is used
developers will no longer see these projects as a viable investment and will turn their attention to other projects – such as luxury homes, luxury townhomes, etc	This change may make low-rise multifamily more attractive to developers, not less.
Split between low and high rise might have been based on envelope area to volume ratio	David Goldstein of NRDC, who was involved in the original negotiations for ASHRAE 90, does not recall this argument, and thinks it may have been based on fire department ladder reach of the time. Also, multifamily buildings have surface-to-volume ratios similar to those of commercial buildings.
This change should originate at model code level	Such changes more typically originate at state and local level, and are subsequently taken up by national model codes. (California recently created a single code applicable to all multifamily buildings.)

Provide your best estimate of the **construction cost** (or cost savings) of your code change proposal?

\$Zero/square foot (\$Zero/ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

Provide your best estimate of the **annual energy savings** (or additional energy use) for your code change proposal?

Zero KWH/ square foot (Zero KWH/ dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

List any **code enforcement** time for additional plan review or inspections that your proposal will require, in hours per permit application: None

Small Business Impact. Describe economic impacts to small businesses: Small business contractors that construct low-rise multifamily buildings, but not low-rise hotel/motel buildings, will have to learn new code requirements.

Housing Affordability. Describe economic impacts on housing affordability: Likely zero impact.

Other. Describe other qualitative cost and benefits to owners, to occupants, to the public, to the environment, and to other stakeholders that have not yet been discussed: There are advantages for code understanding, enforcement, and compliance in having a single set of requirements for all multifamily buildings, regardless of height. In addition, this will allow individual jurisdictions to set a higher building performance standard for low-rise multifamily buildings, as they now do for medium-rise buildings, thus moving the state closer to its goals for efficiency and carbon reduction.

March 2022 Code Comparison Study by Ecotope for NEEA

Multifamily R-2 – Building Geometry & Space Types

	Woody Walk-Up	Double Loaded Corridor
Total Area	7,616 ft ²	26,400 ft ²
Floors	2	3
Fenestration %	18%	34%
Residential Space %	88%	87%
Corridor Space %	N/A	9%
Office/Amenity Spaces (Gym, Lounge, etc.) %	13%	4%

Multifamily R-2 – Model Inputs

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Component	2018 WSEC-R Model	2018 WSEC-C Model
Building Thermal Envelope		
Above Grade Wall	2x6 int. R-21 → U-0.056	2x8 std. R-25 → U-0.051
Glazing	U-0.30, SHGC-N/A	U-0.30; SHGC (PF<2) - 0.38 (S,E,W); 0.51 (N)
Roof (Flat Ceiling)	R-49 → U-0.026	R-49 → U-0.021
Floor Over Unheated	R-30 → U-0.029	R-30 → U-0.029
Slab-on-Grade	R-10 for 2ft → F-0.54	R-10 for 2ft → F-0.54
Infiltration	5 ACH50	0.40 cfm/ft ²
Building Systems		
Heating & Cooling	ER Heat: $\eta = 1.0$	ER Heat: $\eta = 1.0$
Ventilation	ERV – 1.0 cfm/W, 60% Sensible HR Schedule: Cycle 24 hr/day	ERV – 1.2 cfm/W, 60% Sensible HR; Schedule: Cycle 24 hr/day
DHW System	Elec. Resistance: $\eta = 0.95$	Elec. Resistance: $\eta = 0.95$
Hot Water Consumption	Q _{DHW} (kWh/yr) = 570+1034(#occ) Add: 10% reduction for low-flow showerheads	Q _{DHW} (kWh/yr) = 570+1034(#occ) Add: 10% reduction for low-flow showerheads
Thermal Loads		
Lighting Loads/Gains	90% high efficacy (LED fixtures at 65 lumen/W) (Assuming 0.44 W/ft ² – Double Loaded Corr.) (Assuming 0.42 W/ft ² – Woody Walk Up)	Common areas - 0.41 W/ft ² ; Dwelling Units - Unregulated (Assuming 0.44 W/ft ² – Double Loaded Corr.) (Assuming 0.42 W/ft ² – Woody Walk-up)
Equipment Loads/Gains	Unregulated (assuming 0.75 W/ft ²)	Unregulated (assuming 0.75 W/ft ²)
Occupancy Loads/Gains	Occupant Density - 250 ft ² /person Occupancy Gains – 250 Btu/h (Sensible), 200 Btu/h (Latent)	Occupant Density - 250 ft ² /person Occupancy Gains – 250 Btu/h (Sensible), 200 Btu/h (Latent)

Additional Efficiency Measures – C406 & R406

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Optional Measures	From Table R406.3 – 4.5 Credits required	From Table C406.1 – 6 credits required
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Package #1: HPWH Emphasis	1.2 Windows = U-0.20 (<u>1 Credit</u>) 2.2: 2 ACH50, 65% HRV (<u>1.5 Credits</u>) 5.6: Tier III HPWH (3 Credits) R406.2.3: ER Heat (<u>-1 Credit</u>)	C406.9: <u>HPWH</u> w/ min. COP of 3.0 (8 Credits)
Package #2: Envelope Emphasis	7.1: Energy Star Appliances (<u>1.5 Credits</u>) 3.4: Ductless Heat Pumps, HSPF≥10 (<u>2 Credits</u>) 1.4: Windows = U-0.25; (<u>1 Credit</u>) Wall = U-0.045; Floor = U-0.025; Slab = F-0.36;	C406.10: Max 85% of permitted UA (<u>6 Credits</u>)

Energy Study Results

Double Loaded Corridor - EUI (kBtu/sf/yr)

	WSEC-R Baseline	R406 Package #1	R406 Package #2	WSEC-C Baseline	C406 Package #1	C406 Package #2
PLUG LOADS	7.3	7.3	7.3	7.3	7.3	7.3
INTERIOR LIGHTS	4.8	4.8	4.8	4.6	4.6	4.6
SPACE HEATING	5.4	3.7	2.0	4.3	4.3	3.6
SPACE COOLING	0.0	0.0	1.4	0.0	0.0	0.0
HEAT REJECTION	0.0	0.0	0.1	0.0	0.0	0.0
FANS	2.7	2.7	2.7	2.3	2.3	3.2
DOMESTIC HOT WATER	6.8	3.3	6.8	6.8	3.3	6.8
EUI	27	22	25	25	22	25

Woody Walk-up - EUI (kBtu/sf/yr)

	WSEC-R Baseline	R406 Package #1	R406 Package #2	WSEC-C Baseline	C406 Package #1	C406 Package #2
PLUG LOADS	8.0	8.0	8.0	8.0	8.0	8.0
INTERIOR LIGHTS	5.2	5.2	5.2	4.9	4.9	4.9
SPACE HEATING	8.3	5.2	2.3	7.2	6.9	6.3
SPACE COOLING	0.0	0.0	0.6	0.0	0.0	0.0
HEAT REJECTION	0.0	0.0	0.04	0.0	0.0	0.0
FANS	3.8	2.8	4.0	2.4	3.3	3.3
DOMESTIC HOT WATER	7.3	3.6	7.3	7.3	3.6	7.3
EUI	33	25	27	30	27	30